

# Tracking the Deployment of the Integrated Metropolitan ITS Infrastructure in San Juan

## **FY99 Results**

For additional information, please contact:

Joseph I. Peters, Ph.D.  
ITS Program Assessment Coordinator  
ITS Joint Program Office, Room 3416  
400 Seventh St., S.W.  
Washington, D.C. 20590  
(202) 366-2202  
FAX: (202) 493-2027  
E-mail: [joe.peters@fhwa.dot.gov](mailto:joe.peters@fhwa.dot.gov)

## Table of Contents

Part 1 - Background and Purpose.....	1
Part 2 - Summary 1999 Survey Results .....	3
Part 3 - Detailed 1999 Survey Results .....	7
Freeway Management Component Indicators.....	9
Freeway Management Integration Indicators.....	11
Incident Management Component Indicators.....	13
Incident Management Integration Indicators .....	15
Arterial Management Component Indicators.....	17
Arterial Management Integration Indicators.....	19
Electronic Toll Collection Component Indicators .....	21
Electronic Toll Collection Integration Indicators.....	22
Transit Management Component Indicators.....	23
Transit Management Integration Indicators .....	24
Electronic Fare Payment Component Indicators.....	26
Electronic Fare Payment Integration Indicators.....	27
Highway-Rail Intersection Component Indicators.....	28
Highway-Rail Intersection Integration Indicators.....	29
Emergency Management Component Indicators .....	30
Emergency Management Integration Indicators.....	31
Regional Multimodal Traveler Information Component Indicators .....	32
Regional Multimodal Traveler Information Integration Indicators .....	33
Appendix A. Survey Coverage Area.....	A.1
Appendix B. Surveyed Agencies .....	B.1
Appendix C. Freeway Management Components.....	C.1
Appendix D. Freeway Management Integration.....	D.1
Appendix E. Freeway Management Information Collection and Dissemination.....	E.1
Appendix F. Arterial Management Components .....	F.1
Appendix G. Arterial Management Integration.....	G.1
Appendix H. Arterial Management Information Collection and Dissemination.....	H.1
Appendix I. Transit Management Components .....	I.1
Appendix J. Transit Management Integration.....	J.1
Appendix K. Transit Management Information Collection and Dissemination.....	K.1
Appendix L. Emergency Management.....	L.1

## Part 1 - Background and Purpose

In January 1996, Secretary Peña set a goal of deploying the integrated metropolitan Intelligent Transportation System (ITS) infrastructure in 75<sup>1</sup> of the nation's largest metropolitan areas by 2006:

*"I'm setting a national goal: to build an intelligent transportation infrastructure across the United States to save time and lives, and improve the quality of life for Americans. I believe that what we do, we must measure . . . Let us set a very tangible target that will focus our attention . . . I want 75 of our largest metropolitan areas outfitted with a complete intelligent transportation infrastructure in 10 years."*<sup>2</sup>

-- Secretary Peña, 1996

In 1997, the U.S. Department of Transportation initiated an effort to track progress toward fulfillment of this goal by conducting a survey of deployment in the nation's largest metropolitan areas. Traditionally, the product of a transportation infrastructure investment consists of a fixed asset such as a highway, bridge, or public transportation vehicle developed, constructed, or purchased by a single agency. Tracking the level of deployment for such traditional fixed assets can be accomplished by simply counting the number of such assets deployed. Measuring the deployment of the metropolitan ITS infrastructure is more complex because it consists of a set of systems, often deployed by multiple agencies, and integrated through a combination of complex institutional and technical arrangements. In brief, it is often difficult to simply count the number of systems deployed without first devising a measurement approach that captures the essential features of such systems in a consistent fashion across many deployment environments.

In order to track progress toward fulfillment of the Secretary's goal for deployment, the U.S. Department of Transportation ITS Joint Program Office developed the metropolitan ITS deployment tracking methodology. This methodology tracks deployment of the nine components that make up the Metropolitan ITS infrastructure: Freeway Management; Incident Management; Arterial Management; Emergency Management; Transit Management; Electronic Toll Collection; Electronic Fare Payment; Highway-Rail Intersections; and Regional Multimodal Traveler Information. Through a set of indicators tied to the major functions of each component, the level of deployment is tracked for the nation's largest metropolitan areas. In addition, the integration links between agencies operating the infrastructure are also tracked. The details of

---

<sup>1</sup> Since Secretary Peña's speech, the number of metropolitan areas that DOT will measure has been increased from 75 to 78. However, to maintain reporting consistency across the 10-year goal period, this report considers only the original 75 metropolitan areas.

<sup>2</sup> Excerpt of a speech delivered by Secretary of Transportation Peña at the Transportation Research Board in Washington, DC on January 10, 1996.

the methodology are explained elsewhere.<sup>3</sup>

During the summer and fall of 1999, the U.S. DOT undertook a new data collection effort for the purpose of examining ITS deployment progress in the nation's largest metropolitan areas. The San Juan metropolitan area was among the areas surveyed in 1997 and again in 1999. This report presents the results of the 1999 survey efforts and compares the results of the 1997 survey against those observed in 1999. The overall response rate for the surveys administered in the San Juan region was 60% in 1997 and 50% in 1999.

Part 2 contains a summary of the 1999 survey results, and Part 3 provides a comparison of 1999 survey results and the 1997 survey results.

The report also contains a set of appendices containing a map of the survey area, the list of local contacts surveyed along with a status of their response to the survey and a summary of the data collected from the surveys.

Agencies are encouraged to review the data presented in this report for completeness and accuracy and to direct any comments or corrections to the data provided to the contacts listed below:

Steve Gordon  
Oak Ridge National Laboratory  
P.O. Box 2008, 4500N, MS-6207  
Oak Ridge, TN 37831-6207  
(865) 576-8416 (voice)  
(865) 574-3895 (fax)  
gordonsr@ornl.gov

Jeff Trombly  
Science Applications International Corporation  
301 Laboratory Road  
Oak Ridge, TN 37831-2501  
(865) 481-8563 (voice)  
(865) 481-2941 (fax)  
jeffrey.w.trombly@saic.com

---

<sup>3</sup> Additional Resources: "Measuring ITS Deployment and Integration" (Electronic Document Number: 4372). U.S. Department of Transportation, Joint Program Office for Intelligent Transportation Systems, 400 Seventh St., SW (HVH-1), Washington, DC 20590, Phone: 202-366-9536, Fax: 202-366-3302, Web: <http://www.its.dot.gov>.

## Part 2 - Summary 1999 Survey Results

Deployment indicators have been developed for two broad areas of interest: (1) the individual components, including their basic functions and characteristics and (2) integration of components, including how these components work together to provide coordinated regional service. As mentioned earlier, these indicators are expressed as percentages of the possible deployment opportunity and not necessarily what should be deployed based on local needs. Requirements for deployment and integration between each component will vary based on local conditions and cannot be assigned without extensive coordination with individual metropolitan areas.

The following two figures portray the surrogate indicators for each of the nine components in San Juan and the same indicators at the national level. These are judged to be the single best representative of a component and are being used as summary indicator for component. The summary indicators are expressed as a percentage; however, because deployment goals have yet to be established, these indicators should not be read as a comparison of what is deployed versus eventual deployment goals. Instead, they only reflect what is deployed compared to full market saturation (i.e., opportunity for deployment).

Each component indicator was selected to reflect a critical function of the individual components. For example, in the case of Freeway Management, three basic functions were defined: surveillance, traffic control, and information display. The three indicators developed to reflect these functions are: percentage of freeway centerline miles under electronic surveillance (surveillance function), percentage of freeway entrance ramps managed by ramp meters (traffic control function), and percentage of freeway centerline miles covered by permanent VMS, HAR, or in-vehicle signing (information display function). The indicators are surrogates that do not necessarily reflect the full breadth of metropolitan ITS deployment activity.

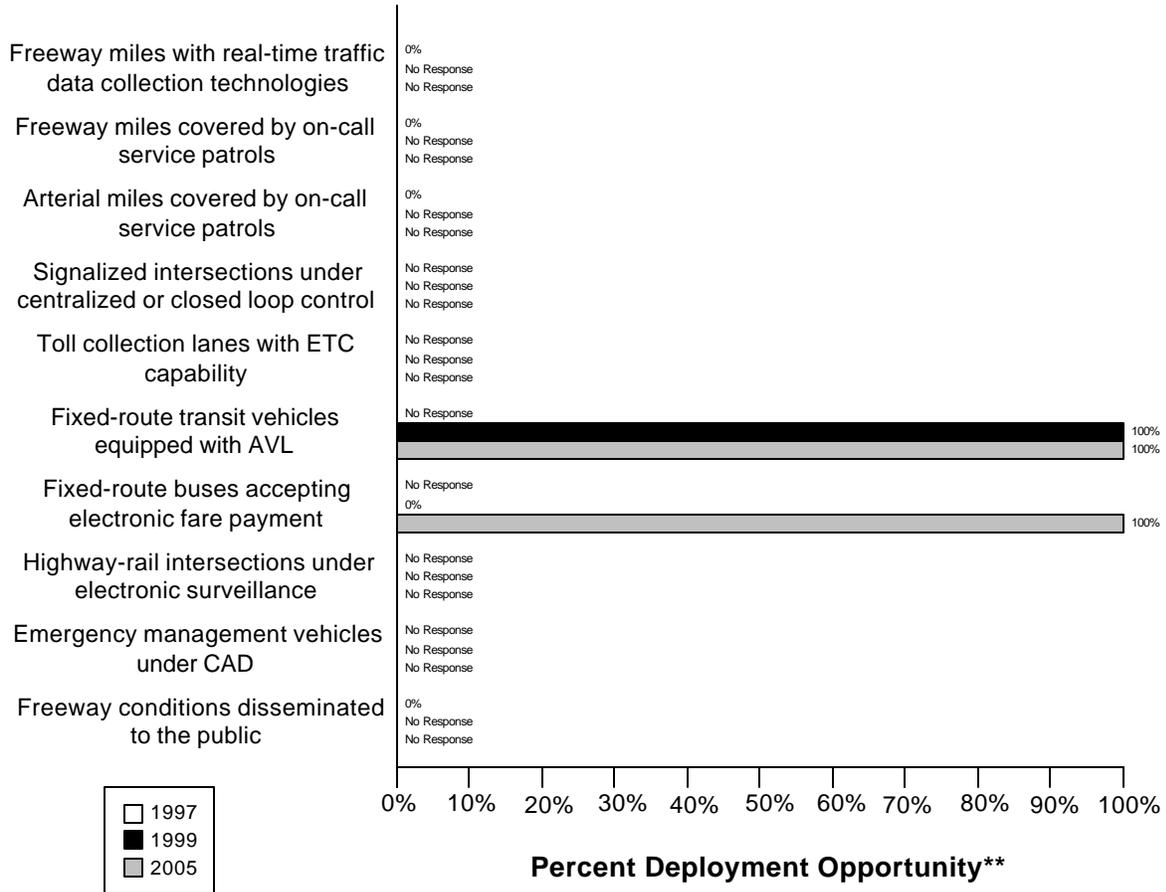
A critical aspect of ITS that provides much of its capability is the integration of individual components to form a unified regional traffic control system. Individual ITS components routinely collect information that is used for purposes internal to that component. For example, the Arterial Management component monitors arterial conditions to revise signal timing and to convey these conditions to travelers through such technologies as variable message signs and highway advisory radio. Other ITS components can make use of this information in formulating their control strategies. For example, Transit Management may alter routes and schedules based on real-time information on arterial traffic conditions, and Freeway Management may alter ramp metering or diversion recommendations based on the same information.

As with the component indicators, definitions for inter- and intra-component integration were developed for each component, and indicators, derived from these definitions, were produced for each component. A total of 34 individual integration indicators was specified and is portrayed in the third figure which follows. Each integration indicator has been assigned a number and an origin/destination path from one ITS infrastructure component to another. For example, the

integration of information from the Freeway Management component to the Regional Multimodal Traveler Information component is identified by the number “10.”

Data as of 5/1/00

## San Juan Summary Indicators\*

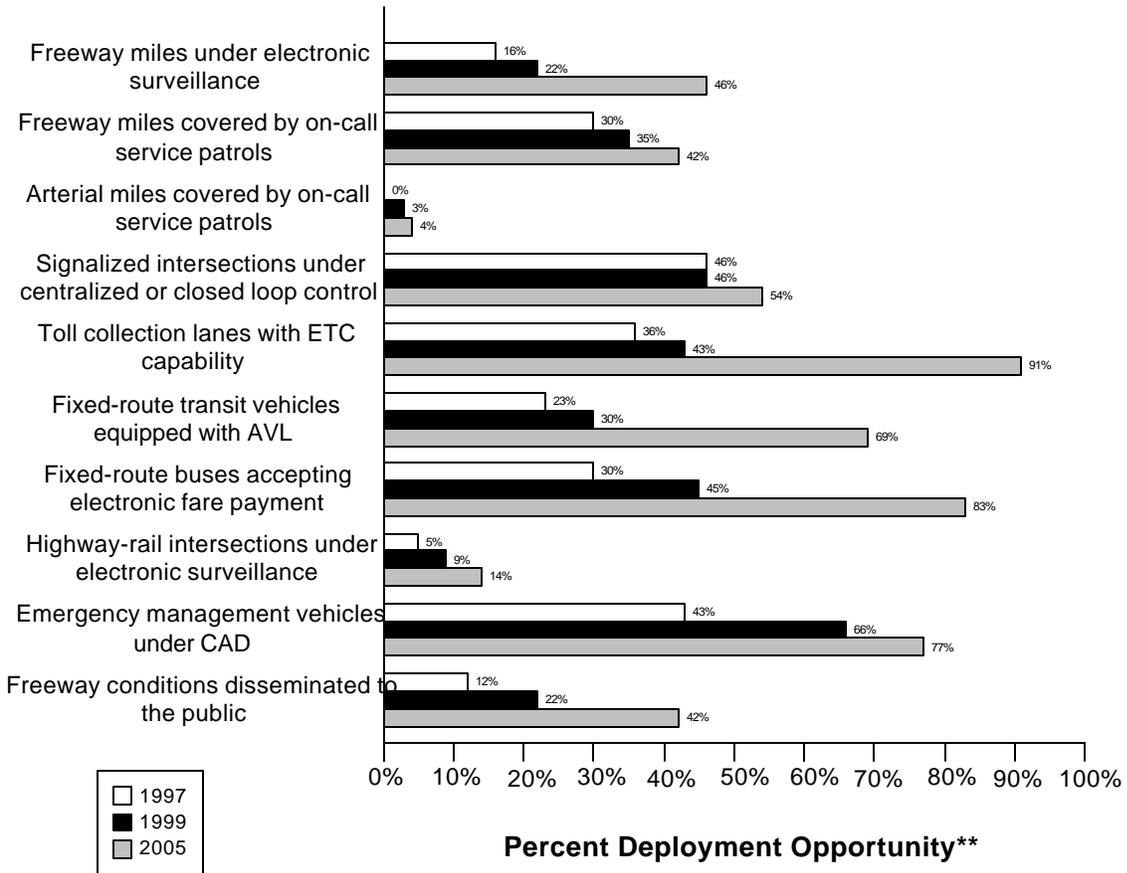


\* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity.

\*\* Deployment opportunity reflects potential totals that do not necessarily reflect actual need.

# National Summary Indicators\*

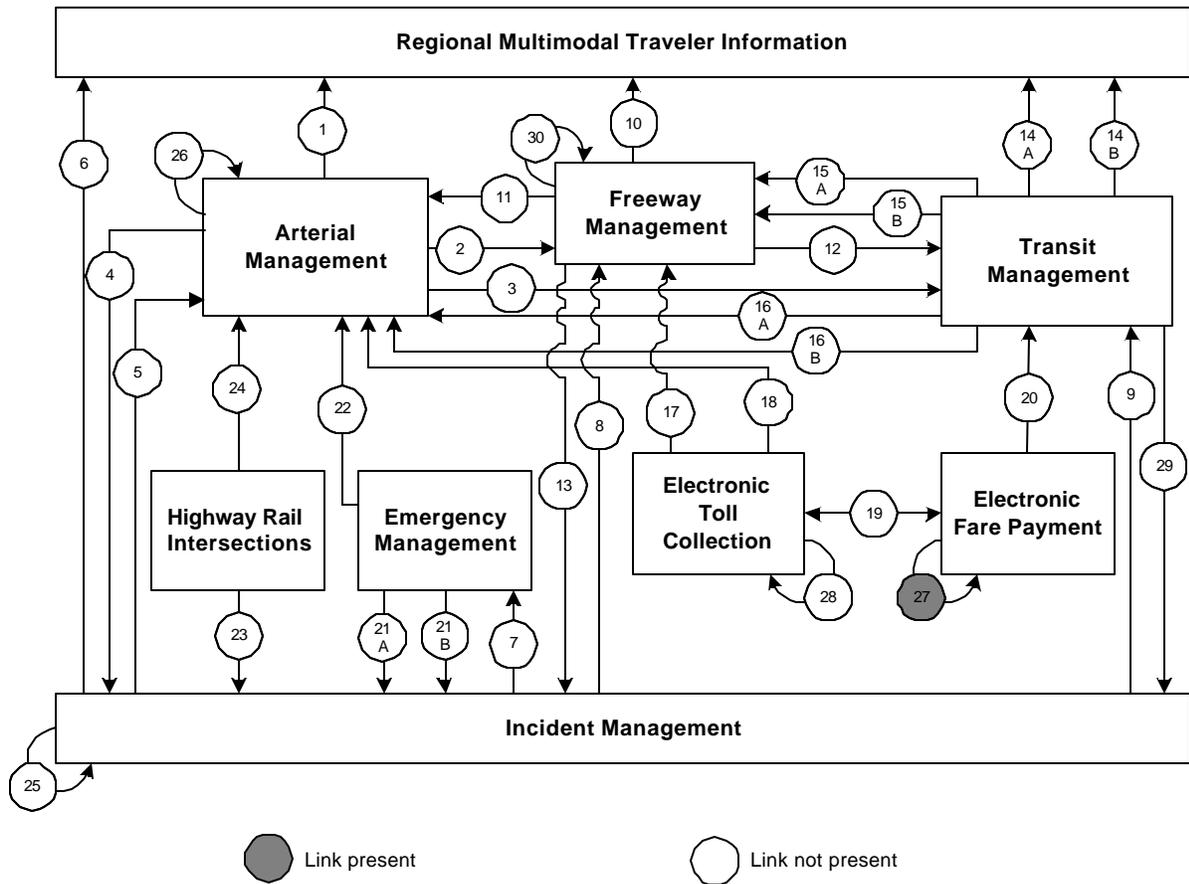
Data as of 5/1/00



\* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity

\*\* Deployment opportunity reflects potential totals that do not necessarily reflect actual need

## San Juan Integration Links



Note: Shading indicates the value of the link. For example a circle half shaded equals 50%

Link	Description	Link	Description
1	Arterial Management to Regional Multimodal Traveler Information	2	Arterial Management to Freeway Management
3	Arterial Management to Transit Management	4	Arterial Management to Incident Management
5	Incident Management to Arterial Management	6	Incident Management to Regional Multimodal Traveler Information
7	Incident Management to Emergency Management.	8	Incident Management to Freeway Management
9	Incident Management to Transit Management	10	Freeway Management to Regional Multimodal Traveler Information
11	Freeway Management to Arterial Management	12	Freeway Management to Transit Management

<b>Link</b>	<b>Description</b>	<b>Link</b>	<b>Description</b>
13	Freeway Management to Incident Management	14a	Transit Management to Regional Multimodal Traveler Information (static route information)
		14b	Transit Management to Regional Multimodal Traveler Information (schedule adherence information)
15a	Transit Management to Freeway Management	16a	Transit Management to Arterial Management
15b	Transit Management to Freeway Management (transit vehicle probes)	16b	Transit Management to Arterial Management (transit vehicle probes)
17	Electronic Toll Collection to Freeway Management (ETC equipped probes)	18	Electronic Toll Collection to Arterial Management (ETC equipped probes)
19	Electronic Fare Payment and Electronic Toll Collection	20	Electronic Fare Payment to Transit Management
21a	Emergency Management to Incident Management (incident notification)	22	Emergency Management to Arterial Management
21b	Emergency Management to Incident Management (incident clearance)		
23	Highway-rail intersections to Incident Management (crossing status)	24	Highway-rail intersections to Arterial Management (crossing status)
25	Incident Management intra component	26	Arterial Management intra component
27	Electronic Fare Payment intra component.	28	Electronic Toll Collection intra component
29	Transit Management to Incident Management (incident reporting)	30	Freeway Management intra component

### **Part 3 - Detailed 1999 Survey Results**

The following figures and tables summarize the complete set of component and integration indicators developed for the San Juan metropolitan area. The figures summarizing the component indicators consist of a bar chart portraying the deployment levels for 1997, 1999, and 2005 accompanied by detailed tables of the data used to calculate each component indicator value (*Num* stands for numerator and *Den* stands for denominator; blank space indicates that no response was received.)

Example: Calculating Component Indicators for Freeway Management

Consider a metropolitan area with 100 miles of freeway and 25 freeway entrance ramps. The area has no ramp meters, 10 freeway miles for which traffic data are collected electronically, and 5 freeway miles, which are covered by highway advisory radio.

The component indicator for electronic surveillance is calculated as  $(10/100)$  or 10%.

The component indicator for ramp meter control is calculated as  $(0/25)$  or 0%.

The component indicator for HAR coverage is calculated as  $(5/100)$  or 5%.

The summary indicator for the metropolitan area is calculated as  $(10\%+0\%+5\%)/3 = 5\%$ .

The figures summarizing the integration indicators consist of a diagram for each of the nine metropolitan ITS components portraying the integration level for 1999 (*italic*) and 2005 (**bold**), accompanied by tables providing an explanation of the data and calculations performed to develop each integration indicator value for 1999 and 2005. Each diagram portrays the proportion of agencies providing information to a component (e.g., the flow of incident information from Incident Management to Freeway Management) and the proportion of agencies providing information from one component to other components (e.g., the flow of freeway travel condition information from Freeway Management to Arterial Management).

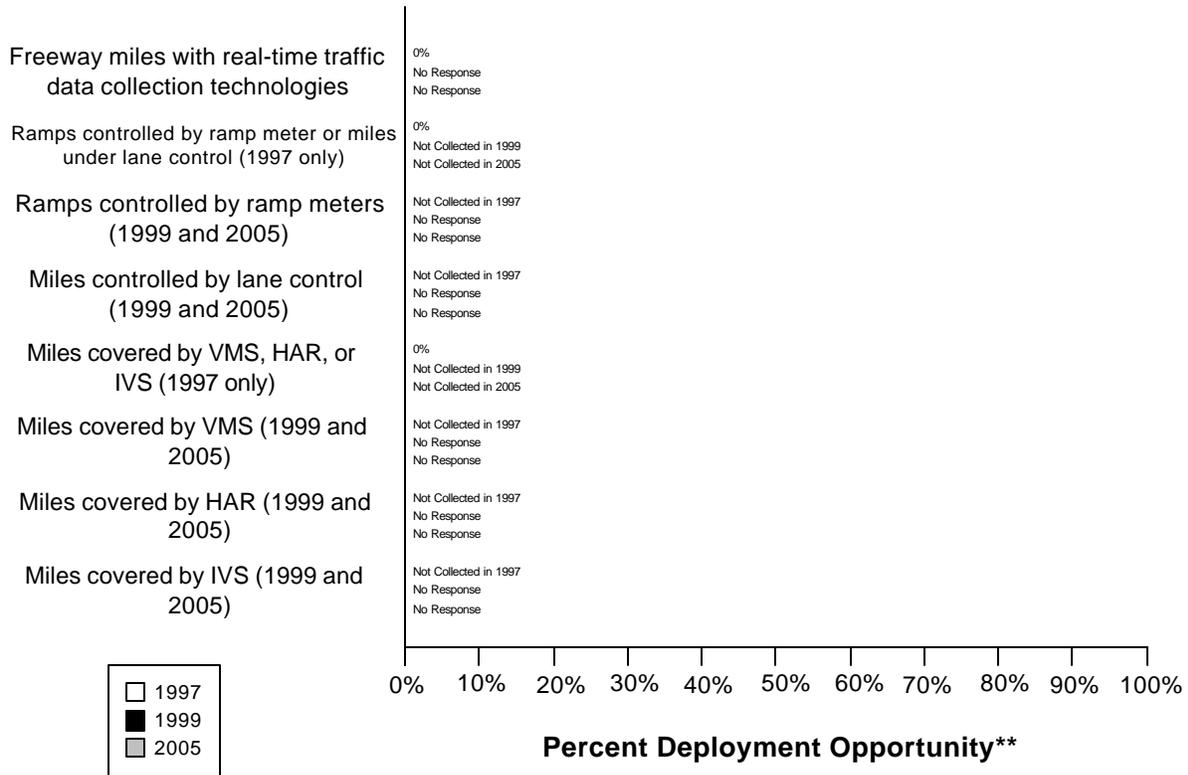
Example: Calculating Integration between Arterial Management and Regional Multimodal Traveler Information

Consider a metropolitan area with three arterial management agencies. One out of three provides information to the public using a Regional Multimodal Traveler Information Media (e.g., internet, kiosk, pager, etc...). The integration indicator is  $1/3$  or 33%.

# Freeway Management Component Indicators

Data as of 5/1/00

## San Juan Freeway Management\*



\* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity.

\*\* Deployment opportunity reflects potential totals that do not necessarily reflect actual need.

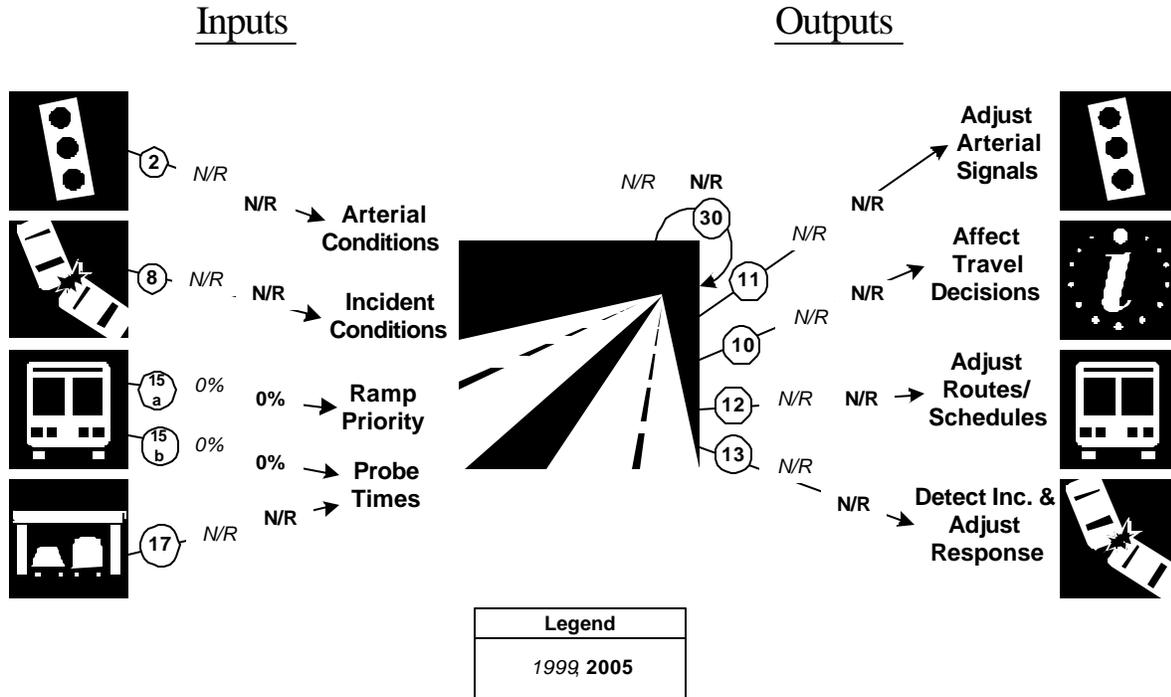
Description	1997			1999			2005		
	Num	Den	%	Num	Den	%	Num	Den	%
Freeway centerline miles are under electronic surveillance for monitoring traffic flow	0	144	0%						
Freeway entrance ramps are controlled by ramp meters or miles under lane control	0	144	0%						

Description	1997			1999			2005		
	Num	Den	%	Num	Den	%	Num	Den	%
Freeway entrance ramps are controlled by ramp meters									
Freeway centerline miles will be controlled by lane control									
Freeway miles are covered by VMS, HAR, or IVS	0	144	0%						
Freeway miles are covered by VMS									
Freeway miles are covered by HAR									
Freeway miles are covered by IVS									

# Freeway Management Integration Indicators

## San Juan

### Freeway Management Integration\*



\* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity

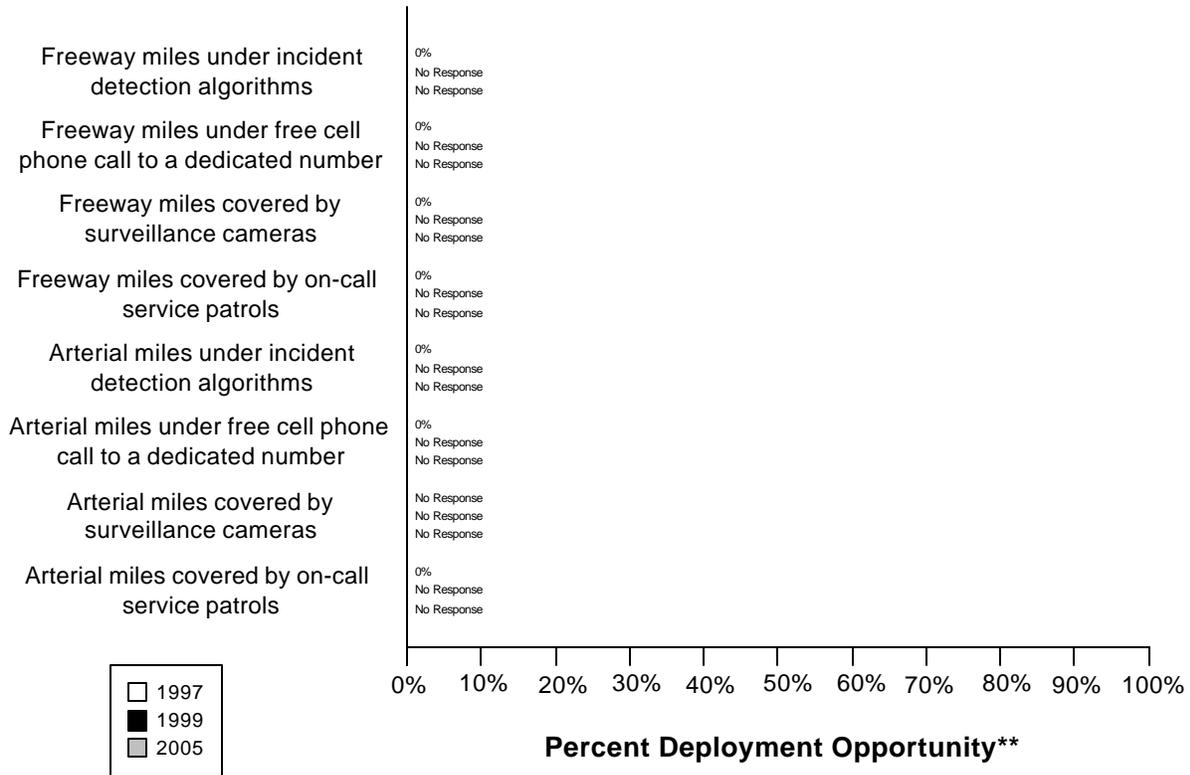
Link Description	1999	2005
2. Arterial Management agencies sending information to Freeway Management	( 0/ )	( 0/ )
8. Incident Management agencies sending information to Freeway Management	( 0/ )	( 0/ )
15a. Transit management agencies with vehicles equipped with ramp meter priority	( 0/ 1) 0%	( 0/ 1) 0%
15b. Transit Management agencies with vehicles equipped as probes	( 0/ 1) 0%	( 0/ 1) 0%
17. Freeway Management agencies receiving freeway conditions from vehicle probes	( 0/ )	( 0/ )
30. Freeway Management agencies sending information to another Freeway Management agency	( 0/ )	( 0/ )
11. Freeway Management agencies sending information to Arterial Management	( 0/ )	( 0/ )

<b>Link Description</b>	<b>1999</b>	<b>2005</b>
10. Freeway Management agencies disseminating freeway conditions to the public	( 0/)	( 0/)
12. Freeway Management agencies sending freeway conditions to Transit Management	( 0/)	( 0/)
13. Freeway Management agencies sending freeway conditions to Incident Management	( 0/)	( 0/)

# Incident Management Component Indicators

Data as of 5/1/00

## San Juan Freeway and Arterial Incident Management\*



\* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity.

\*\* Deployment opportunity reflects potential totals that do not necessarily reflect actual need.

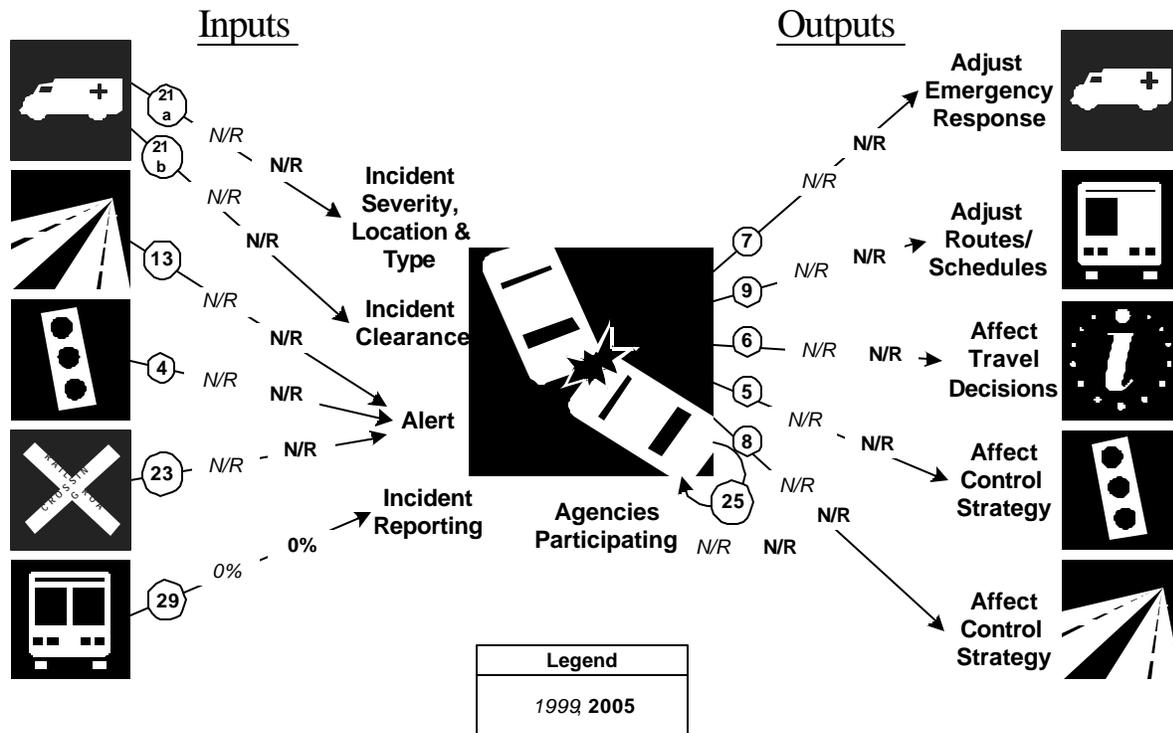
Description	1997			1999			2005		
	Num	Den	%	Num	Den	%	Num	Den	%
Freeway miles are covered by incident detection algorithms	0	144	0%						
Freeway miles are covered by free cellular phone calls to a dedicated number	0	144	0%						
Freeway miles are covered by surveillance cameras.	0	144	0%						

Description	1997			1999			2005		
	Num	Den	%	Num	Den	%	Num	Den	%
Freeway miles are covered by on-call publicly-sponsored service patrol or towing services.	0	144	0%						
Arterial miles are covered by incident detection algorithms	0	666	0%						
Arterial miles are covered by free cellular phone calls to a dedicated number	0	666	0%						
Arterial miles are covered by surveillance cameras		666							
Arterial miles are covered by on-call publicly-sponsored service patrol or towing services	0	666	0%						

# Incident Management Integration Indicators

## San Juan

### Incident Management Integration\*



\* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity

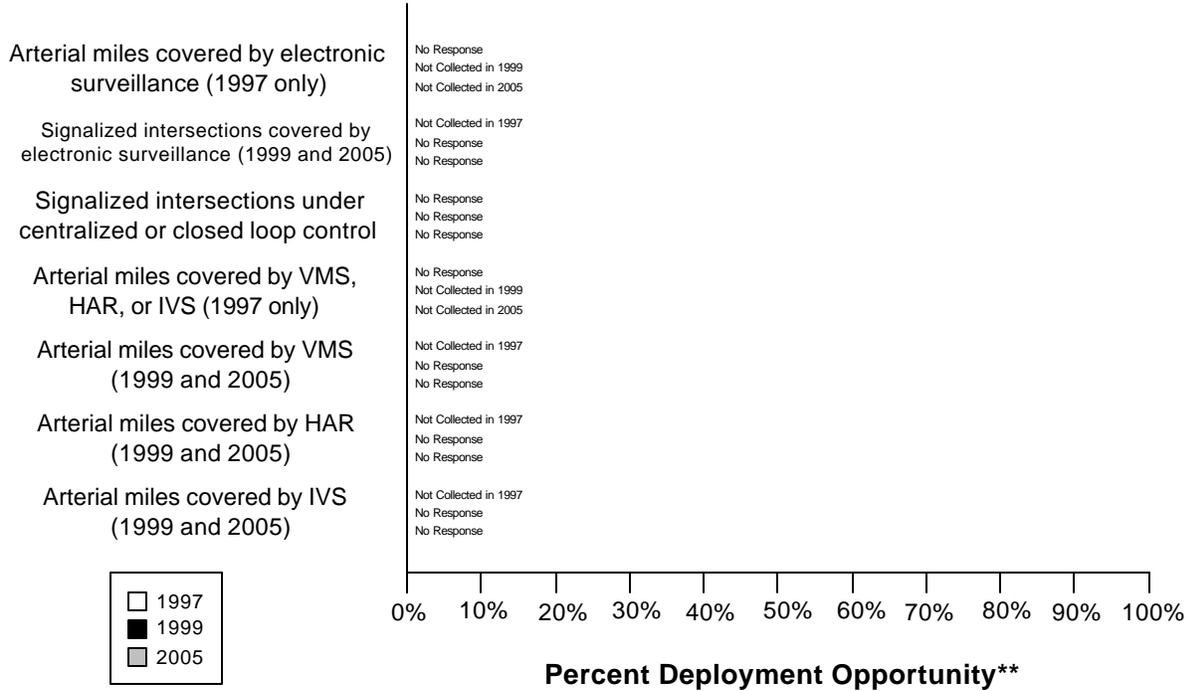
Link Description	1999	2005
21a. Incident management agencies receiving incident severity from Emergency Management	( 0/ )	( 0/ )
21b. Incident management agencies receiving incident clearance activities from Emergency Management	( 0/ )	( 0/ )
13. Freeway Management agencies sending freeway conditions to Incident Management	( 0/ )	( 0/ )
4. Arterial Management agencies sending arterial conditions to Incident Management	( 0/ )	( 0/ )
23. Arterial Management agencies receive information on highway-rail intersection crossing blockages for the purpose of managing incident response	( 0/ )	( 0/ )
29. Transit Management agencies report traffic incidents as part of an organized regional incident management program	( 0/ 1 ) 0%	( 0/ 1 ) 0%

<b>Link Description</b>	<b>1999</b>	<b>2005</b>
7. Incident management agencies transfer information describing incident severity, location, and type to Emergency Management agencies	( 0/)	( 0/)
9. Incident Management agencies transfer information describing incident severity, location, and type to Transit Management agencies	( 0/)	( 0/)
6. Incident Management agencies disseminate information describing incident severity, location, and type to the public	( 0/)	( 0/)
5. Incident Management agencies transfer information describing incident severity, location, and type to Arterial Management agencies	( 0/)	( 0/)
8. Incident Management agencies transfer information describing incident severity, location, and type to Freeway Management agencies	( 0/)	( 0/)
25. Police, fire, and EMS agencies participating in a formal incident management plan/team	( 0/)	( 0/)

# Arterial Management Component Indicators

Data as of 5/1/00

## San Juan Arterial Management\*



\* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity.

\*\* Deployment opportunity reflects potential totals that do not necessarily reflect actual need.

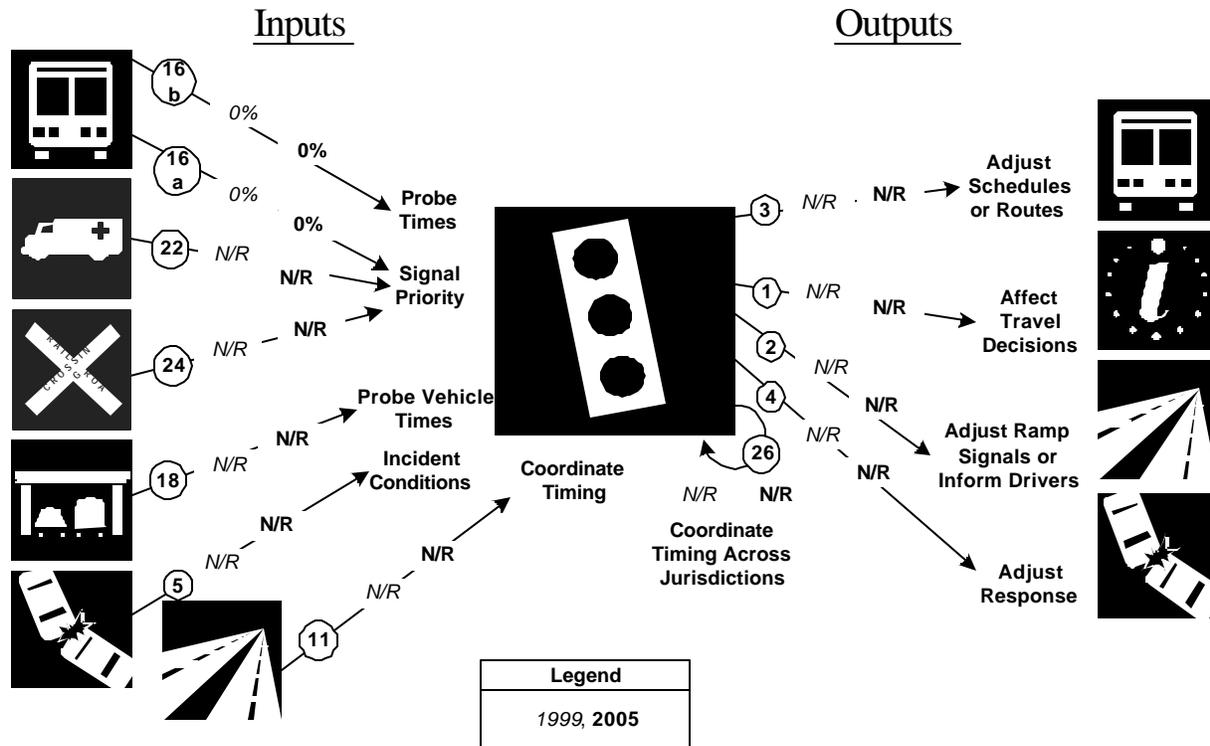
Description	1997			1999			2005		
	Num	Den	%	Num	Den	%	Num	Den	%
Arterial miles covered by electronic surveillance		666							
Signalized intersections are covered by electronic surveillance for monitoring traffic flow									
Signalized intersections are under centralized or closed loop control									

Description	1997			1999			2005		
	Num	Den	%	Num	Den	%	Num	Den	%
Arterial miles are covered by VMS, HAR, or IVS		666							
Arterial miles are covered by VMS									
Arterial miles are covered by HAR									
Arterial miles are covered by IVS									

# Arterial Management Integration Indicators

## San Juan

### Arterial Management Integration\*



\* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity

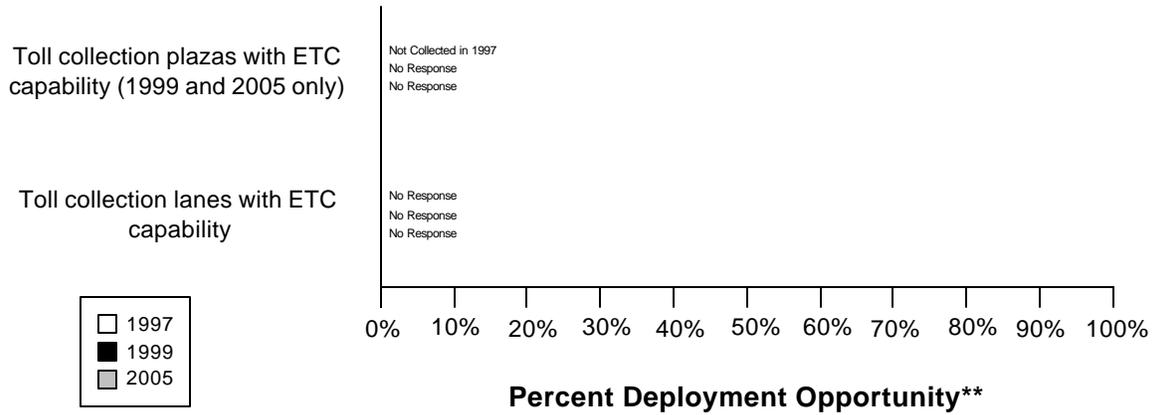
Link Description	1999	2005
16a. Transit management agencies with vehicles equipped with traffic signal priority	( 0/ 1) 0%	( 0/ 1) 0%
16b. Transit Management agencies have vehicles equipped as probes on arterials	( 0/ 1) 0%	( 0/ 1) 0%
22. Emergency Management agencies have vehicles equipped with traffic signal preemption capability	( 0/ )	( 0/ )
24. Arterial Management agencies have traffic signals within 200 feet of a highway rail intersection with the capability of having their signal timing adjusted in response to a train crossing	( 0/ )	( 0/ )
18. Number of Arterial Management agencies receiving information from vehicle probes	( 0/ )	( 0/ )
5. Incident Management agencies transfer information describing incident severity, location, and type to Arterial Management	( 0/ )	( 0/ )

<b>Link Description</b>	<b>1999</b>	<b>2005</b>
11. Freeway Management agencies transfer freeway travel times, speeds, and conditions to Arterial Management agencies	( 0/)	( 0/)
3. Arterial Management agencies transfer arterial travel times, speeds, and conditions to Transit Management	( 0/)	( 0/)
1. Arterial Management agencies disseminate arterial travel times, speeds, and conditions to the public	( 0/)	( 0/)
2. Arterial Management agencies send traffic condition information to Freeway Management	( 0/)	( 0/)
4. Arterial Management agencies transfer arterial travel times, speeds, and conditions to Incident Management	( 0/)	( 0/)
26. Arterial Management agencies under cooperative agreement to share traffic signal timing for coordinated response	( 0/)	( 0/)

# Electronic Toll Collection Component Indicators

Data as of 5/1/00

## San Juan Electronic Toll Collection\*



\* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity.

\*\* Deployment opportunity reflects potential totals that do not necessarily reflect actual need.

Description	1997			1999			2005		
	Num	Den	%	Num	Den	%	Num	Den	%
Toll collection plazas with ETC capability									
Toll collection lanes with ETC capability									

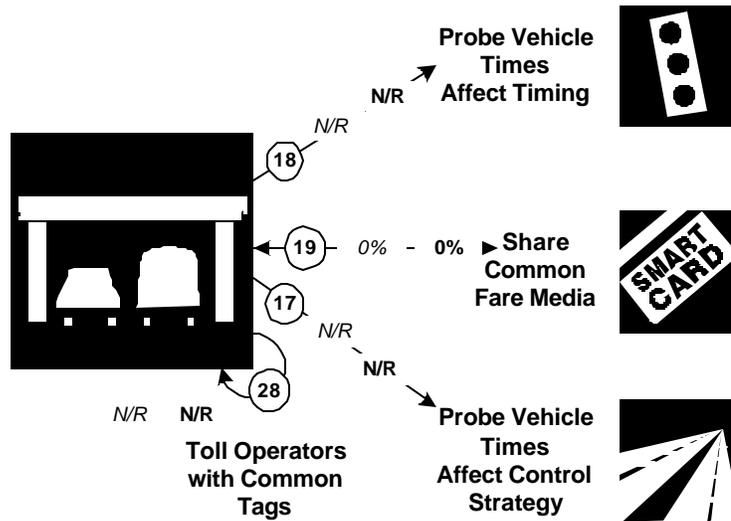
**Electronic Toll Collection Integration Indicators**

**San Juan**

**Electronic Toll Collection Integration\***

Inputs

Outputs



Legend
1999, 2005

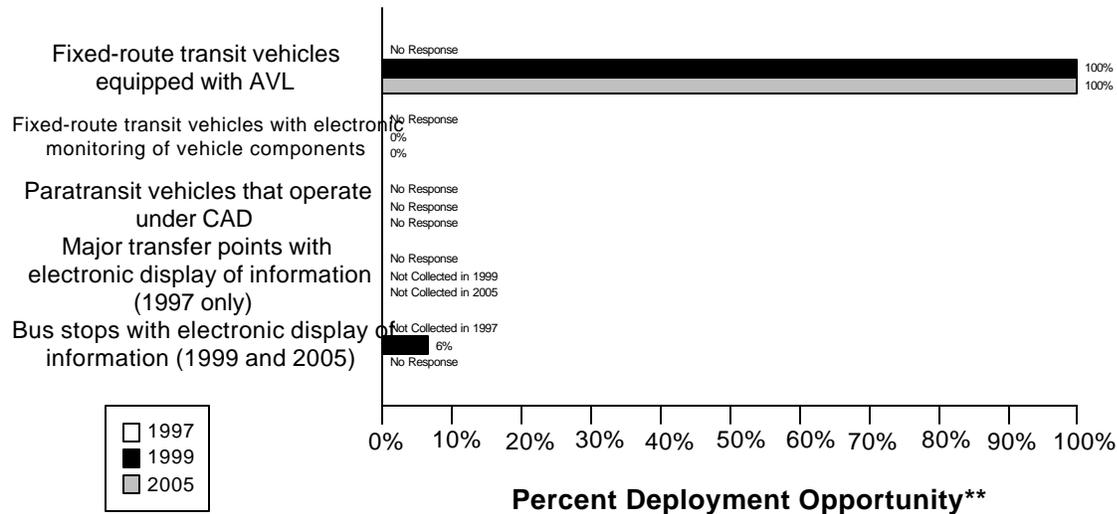
\* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity

Link Description	1999	2005
18. Number of Arterial Management agencies receiving information from vehicle probes	( 0/ )	( 0/ )
19. Transit agencies that accept electronic payment through the use of electronic toll collection media	( 0/ 1 ) 0%	( 0/ 1 ) 0%
17. Freeway Management agencies receiving information from vehicle probes	( 0/ )	( 0/ )
28. Toll operators using common toll tag technology	( 0/ )	( 0/ )

# Transit Management Component Indicators

Data as of 5/1/00

## San Juan Transit Management\*



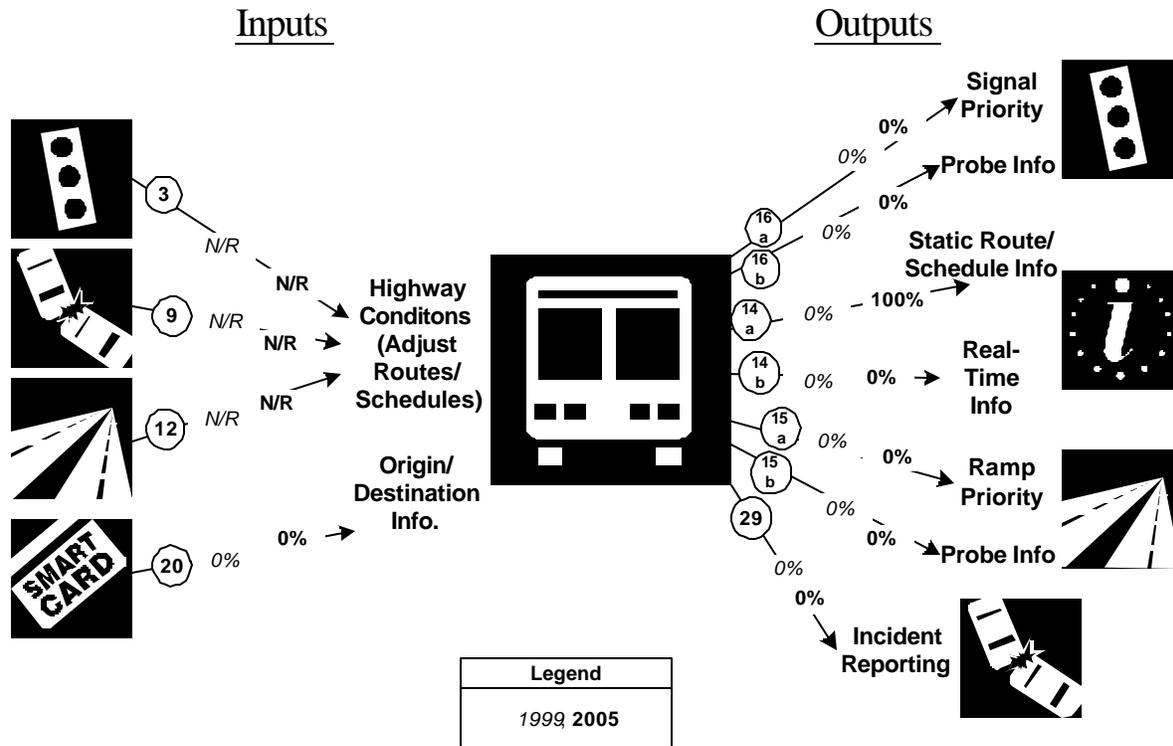
\* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity.  
 \*\* Deployment opportunity reflects potential totals that do not necessarily reflect actual need.

Description	1997			1999			2005		
	Num	Den	%	Num	Den	%	Num	Den	%
Fixed-route transit vehicles are equipped with AVL				30	30	100%	30	30	100%
Fixed-route transit vehicles are equipped with electronic monitoring of vehicle component				0	30	0%	0	30	0%
Paratransit vehicles operate under computer-aided dispatch									
Percent fixed-route transfer locations with electronic display of information									
Bus stops display information to the public				4	63	6%			

# Transit Management Integration Indicators

## San Juan

### Transit Management Integration\*



\* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity

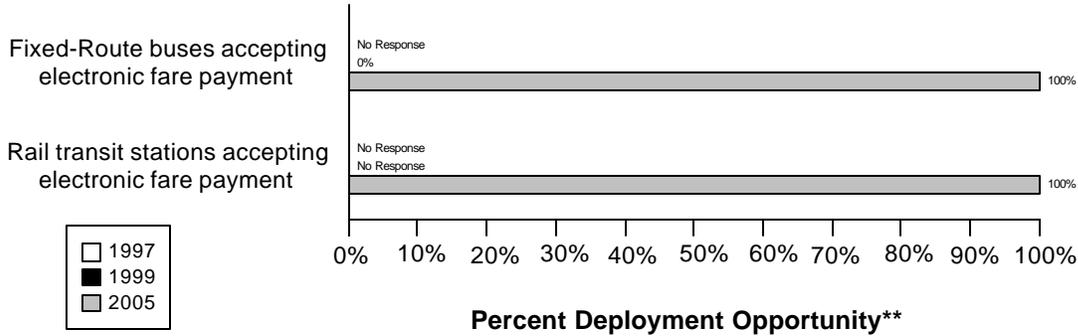
Link Description	1999	2005
3. Arterial Management agencies transfer arterial travel times, speeds, and conditions to Transit Management	( 0/ )	( 0/ )
9. Incident management agencies transfer information describing incident severity, location, and type to Transit Management	( 0/ )	( 0/ )
12. Freeway Management agencies transfer freeway travel times, speeds, and conditions to Transit Management	( 0/ )	( 0/ )
20. Transit Management agencies using Electronic Fare Payment data in transit service planning	( 0/ 1) 0%	( 0/ 1) 0%
16a. Transit Management agencies have vehicles equipped with traffic signal priority capability	( 0/ 1) 0%	( 0/ 1) 0%
16b. Transit Management agencies have vehicles equipped as probes on arterials	( 0/ 1) 0%	( 0/ 1) 0%
14a. Transit Management agencies disseminate information describing transit routes, schedules, and fares to travelers	( 0/ 1) 0%	( 1/ 1) 100%

<b>Link Description</b>	<b>1999</b>	<b>2005</b>
14b. Transit Management agencies disseminate information describing schedule/route adherence to travelers	( 0/ 1) 0%	( 0/ 1) 0%
15a. Transit Management agencies have vehicles equipped with ramp meter priority capability	( 0/ 1) 0%	( 0/ 1) 0%
15b. Transit Management agencies have vehicles equipped as probes on freeways	( 0/ 1) 0%	( 0/ 1) 0%
29. Transit Management agencies that report traffic incidents as part of an organized regional Incident Management program	( 0/ 1) 0%	( 0/ 1) 0%

# Electronic Fare Payment Component Indicators

Data as of 5/1/00

## San Juan Electronic Fare Payment\*



\* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity.  
 \*\* Deployment opportunity reflects potential totals that do not necessarily reflect actual need.

Description	1997			1999			2005		
	Num	Den	%	Num	Den	%	Num	Den	%
Fixed-route transit vehicles that accept electronic payment				0	30	0%	30	30	100%
Rail transit stations that accept electronic payment				0	0		16	16	100%

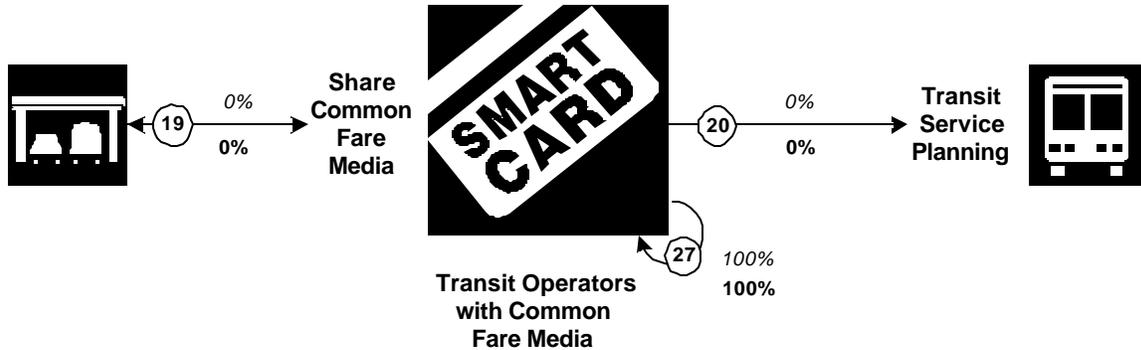
**Electronic Fare Payment Integration Indicators**

**San Juan**

**Electronic Fare Payment Integration\***

Inputs

Outputs



Legend
1999
2005

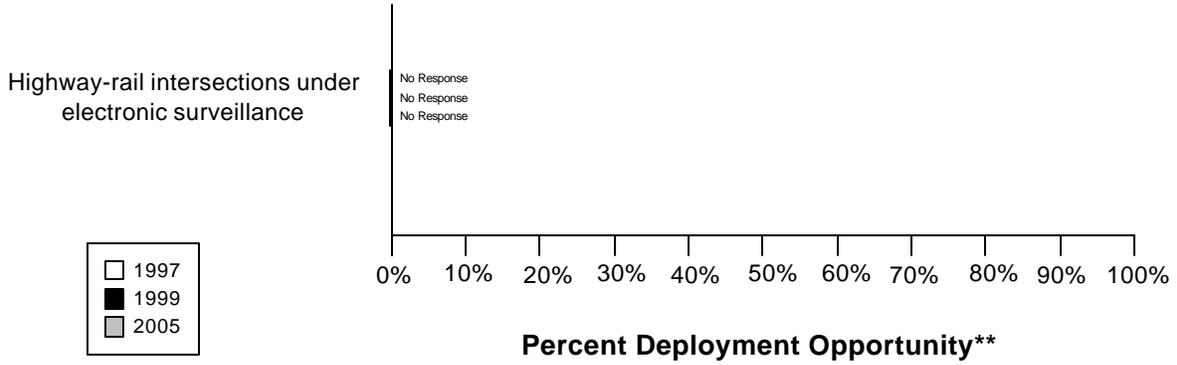
\* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity

Link Description	1999	2005
19. Transit agencies that accept electronic payment through the use of electronic toll collection media	( 0/ 1) 0%	( 0/ 1) 0%
20. Transit Management agencies use Electronic Fare Payment data in transit service planning	( 0/ 1) 0%	( 0/ 1) 0%
27. Transit Management agencies that use the same electronic payment system	( 1/ 1) 100%	( 1/ 1) 100%

# Highway Rail Intersection Component Indicators

Data as of 5/1/00

## San Juan Highway-Rail Intersections\*



\* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity.

\*\* Deployment opportunity reflects potential totals that do not necessarily reflect actual need.

Description	1997			1999			2005		
	Num	Den	%	Num	Den	%	Num	Den	%
Highway-rail intersections are under electronic surveillance									

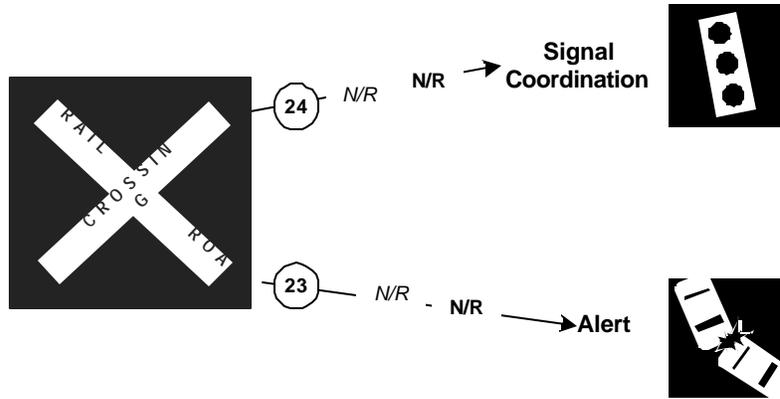
# Highway Rail Intersection Integration Indicators

## San Juan

### Highway Rail Intersections Integration\*

Inputs

Outputs



Legend
1999, 2005

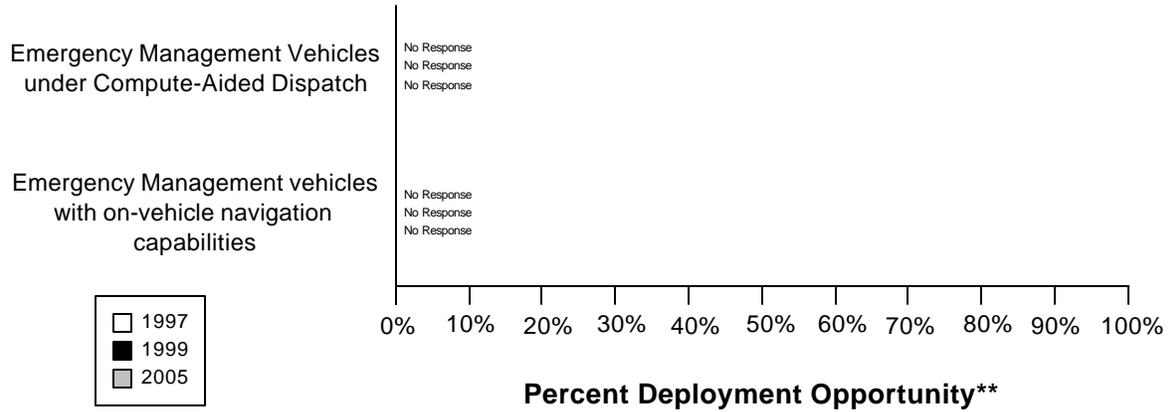
\* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity

Link Description	1999	2005
24. Arterial Management agencies with traffic signals within 200 feet of a highway rail intersection with the capability of having their signal timing adjusted in response to a train crossing	( 0/ )	( 0/ )
23. Arterial Management agencies receive information on highway-rail intersection crossing blockages for the purpose of managing incident response	( 0/ )	( 0/ )

# Emergency Management Component Indicators

Data as of 5/1/00

## San Juan Emergency Management\*



\* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity.

\*\* Deployment opportunity reflects potential totals that do not necessarily reflect actual need.

Description	1997			1999			2005		
	Num	Den	%	Num	Den	%	Num	Den	%
Public sector emergency vehicles that operate under computer-aided dispatch									
Public sector emergency vehicles that have in-vehicle route guidance capability									

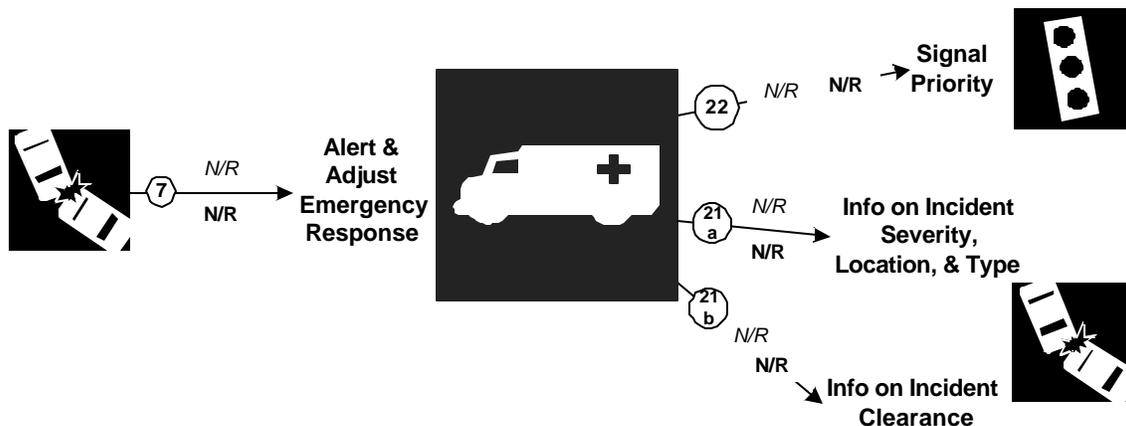
# Emergency Management Integration Indicators

## San Juan

### Emergency Management Integration\*

Inputs

Outputs



Legend
1999, 2005

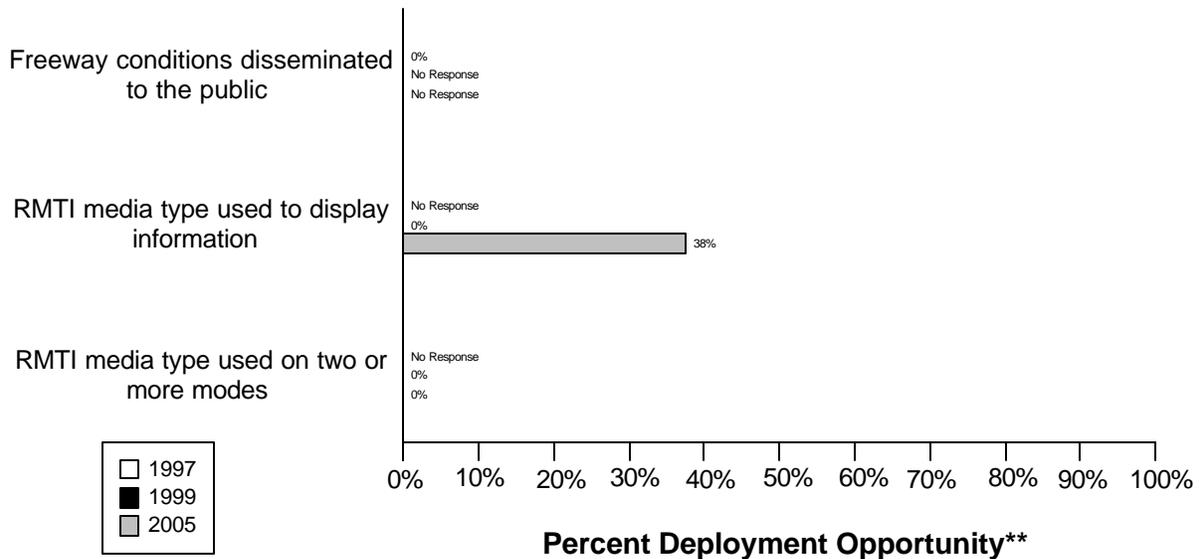
\* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity

Link Description	1999	2005
7. Freeway Management agencies transfer information describing incident severity, location, and type to Emergency Management agencies	( 0/ )	( 0/ )
22. Emergency Management agencies have vehicles equipped with traffic signal preemption capability	( 0/ )	( 0/ )
21a. Freeway Management agencies receive incident severity, location, and type data from Emergency Management agencies	( 0/ )	( 0/ )
21b. Freeway Management agencies receive incident clearance activities information from Emergency Management agencies	( 0/ )	( 0/ )

**Regional Multimodal Traveler Information Component Indicators**

Data as of 5/1/00

**San Juan**  
Regional Multimodal Traveler Information\*



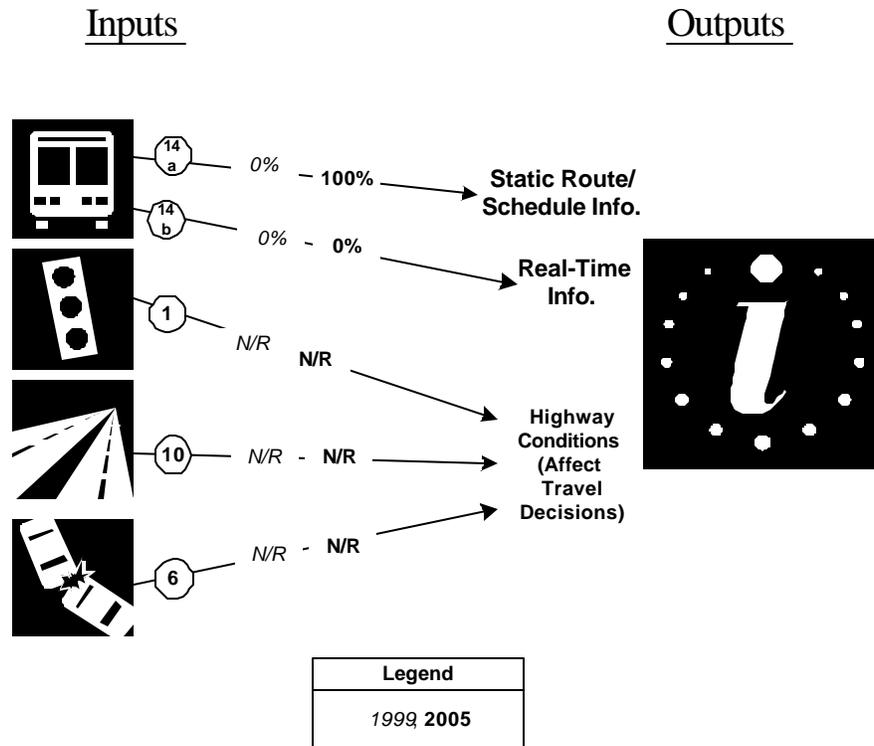
\* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity.  
 \*\* Deployment opportunity reflects potential totals that do not necessarily reflect actual need.

Description	1997			1999			2005		
	Num	Den	%	Num	Den	%	Num	Den	%
Freeway conditions disseminated to travelers	0	144	0%						
Possible RMTI media types are used to display information to travelers				0	8	0%	3	8	38%
Possible RMTI media are used to display information on <i>two or more modes</i> to travelers				0	8	0%	0	8	0%

# Regional Multimodal Traveler Information Integration Indicators

## San Juan

### Regional Multimodal Traveler Information Integration\*



\* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity

Link Description	1999	2005
14a. Transit Management agencies that disseminate information describing transit routes, schedules, and fares to travelers	( 0/ 1) 0%	( 1/ 1) 100%
14b. Transit Management agencies that disseminate information describing schedule/route adherence to travelers	( 0/ 1) 0%	( 0/ 1) 0%
1. Arterial Management agencies that disseminate arterial travel times, speeds, and conditions to the public	( 0/ )	( 0/ )
10. Freeway Management agencies that disseminate freeway travel times, speeds, and conditions to travelers	( 0/ )	( 0/ )
6. Incident Management agencies that disseminate information describing incident severity, location, and type to the public	( 0/ )	( 0/ )

**Appendix A**  
**Survey Coverage Area**

**MAP NOT AVAILABLE**

**Appendix B**  
**Surveyed Agencies**

### Surveyed Agencies

Agency Name	Contact	Phone	Fax	1999		1997	
				Out	In	Out	In
<b>SAN JUAN</b>							
<b>Freeway Management</b>							
Highway and Transportation Authority	Roberto (Bobby) Silva	(787) 729-1538	(787) 722-1321	8/5/1999		8/19/1997	8/28/1997
<b>MPO</b>							
Puerto Rico Department of Transportation &	Freya Toledo	(787) 723-1390	787-724-3750	7/15/1999			
<b>Transit Management</b>							
Puerto Rico Highway and Transportation	Freya Toledo	(787) 723-1390	787-724-3750	8/9/1999	9/3/1999	9/24/1997	

**Appendix C**  
**Freeway Management Components**

**Appendix D**  
**Freeway Management Integration**

**Appendix E**  
**Freeway Management Information Collection and Dissemination**

**Appendix F**  
**Arterial Management Components**

**Appendix G**  
**Arterial Management Integration**

**Appendix H**  
**Arterial Management Information Collection and Dissemination**

**Appendix I**  
**Transit Management Components**

Transit Management  
Agencies for Metropolitan Area: San Juan

	Puerto Rico Highway and Transportation Authority	
	1999	2005
<b>Agency Returned Survey?</b>	Yes	
<b>Number of vehicles used in revenue service</b>		
Fixed Route Bus	30	30
Heavy or Rapid Rail	0	74
Light Rail	NR	NR
Demand Responsive	NR	NR
Commuter Rail	NR	NR
Ferry Boat	NR	NR
<b>Have of plan to have an Automated Vehicle Location System?</b>	Yes	
<b>Primary and Secondary Location Technologies Used</b>		
<u>Primary Technologies</u>		
GPS	No	No
Sign/Odometer	Yes	Yes
Dead-Reckoning	No	No
LORAN C	No	No
Other	No	No
<u>Backup Technologies</u>		
GPS	No	No
Sign/Odometer	No	No
Dead-Reckoning	No	No
LORAN C	No	No
Other	No	No
<b>Number of Vehicles Equipped with AVL</b>		
Fixed Route Bus	30	30
Heavy or Rapid Rail	NR	NR
Light Rail	NR	NR
Demand Responsive	NR	NR
Commuter Rail	NR	NR
Ferry Boat	NR	NR
<b>Motor Buses Operated as Vehicle Probes</b>		
Number of Motor Buses equipped as probes on freeways?	NR	
Number of Motor Buses equipped as probes on arterials?	NR	
<b>Have Organized Regional Incident Management Program?</b>	No	
<b>Have Automated Traveler Information System?</b>	Yes	

Transit Management  
Agencies for Metropolitan Area: San Juan

	Puerto Rico Highway and Transportation Authority	
	1999	2005
<i>Services Automated Traveler Info. System Applies:</i>		
Fixed Route	Yes	
Heavy Rail	Yes	
Light Rail	No	
Demand Responsive	No	
Commuter Rail	No	
Ferry	No	
<b>Locations where traveler information is displayed to public</b>		
Number of bus stops on fixed transit routes	63	NR
Bus stops on fixed transit routes that display traveler info to the public	4	NR
Number of rail stations	0	16
Number of rail stations that display traveler information	0	16
Number of other locations that display traveler information to public	0	NR
<b>Number of vehicles the traveler information system has available</b>		
Fixed Route Bus	0	0
Heavy or Rapid Rail	0	0
Light Rail	NR	NR
Demand Responsive	NR	NR
Commuter Rail	NR	NR
Ferry Boat	NR	NR
<b>Deployment of Communications Technology</b>		
<i>Attributes of Radio System:</i>		
Digital?	Yes	
Analog?	No	
Trunked?	Yes	
Regular?	No	
<b>Services that use a Digital or Trunked Radio System</b>		
<i>Digital Only</i>		
Fixed Route Bus	No	No
Heavy or Rapid Rail	No	No
Light Rail	No	No
Demand Responsive	No	No
Commuter Rail	No	No
Ferry Boat	No	No
<i>Trunked Only</i>		
Fixed Route Bus	No	No
Heavy or Rapid Rail	No	No
Light Rail	No	No

Transit Management  
Agencies for Metropolitan Area: San Juan

	Puerto Rico Highway and Transportation Authority	
	1999	2005
Demand Responsive	No	No
Commuter Rail	No	No
Ferry Boat	No	No
<b>Have of plan to have Automatic Passenger Counters (APCs)?</b>	No	
<b>Methods used to count passengers</b>		
Treadle Mats	No	
Infrared Beams	No	
<b>Primary and Secondary Location Technologies Used</b>		
<i>Primary Technologies</i>		
GPS	No	No
Differential GPS	No	No
Signpost/Odometer	No	No
Dead_Reckoning	No	No
LORAN C	No	No
Other	No	No
<i>Backup Technologies</i>		
GPS	No	No
Differential GPS	No	No
Signpost/Odometer	No	No
Dead_Reckoning	No	No
LORAN C	No	No
Other	No	No
<b>Number of Vehicles with APCs</b>		
Fixed Route Bus	NR	NR
Heavy or Rapid Rail	NR	NR
Light Rail	NR	NR
Demand Responsive	NR	NR
Commuter Rail	NR	NR
Ferry Boat	NR	NR
<b>Remote Real-Time Monitoring and Computer Assisted Dispatching</b>		
<i>Remote Real-Time Monitoring</i>		
Fixed Route Bus	0	0
Heavy or Rapid Rail	0	74
Light Rail	NR	NR
Demand Responsive	NR	NR
Commuter Rail	NR	NR
Ferry Boat	NR	NR
<i>Automated Dispatching or Control Software</i>		

Transit Management  
Agencies for Metropolitan Area: San Juan

	Puerto Rico Highway and Transportation Authority	
	1999	2005
Fixed Route Bus	NR	NR
Heavy or Rapid Rail	0	74
Light Rail	NR	NR
Demand Responsive	NR	NR
Commuter Rail	NR	NR
Ferry Boat	NR	NR
<b>Coordinate or plan to coordinate travel request and vehicle dispatching for multiple agencies?</b>	No	
<b>Is there or will there be a Transportation Management Center (TMC) in the region that controls transit and highway modes?</b>	Yes	
Modes that TMC currently controls:		
Highways	No	Yes
Fixed Route Bus	No	No
Heavy or Rapid Rail	No	No
Light Rail	No	No
Demand Responsive	No	No
Commuter Rail	No	No
Ferry Boat	No	No
Other	No	No
<b>Priority at Traffic Signals and Ramp Meter Priority</b>		
<i>Priority at Traffic Signals</i>		
Fixed Route Bus	NR	NR
Light Rail	NR	NR
Demand Responsive	NR	NR
<i>Ramp Meter Priority</i>		
Fixed Route Bus	NR	NR
Demand Responsive	NR	NR
<b>Number of Vehicles Equipped with Navigation Aids</b>		
Fixed Route Bus	NR	NR
Heavy or Rapid Rail	NR	NR
Light Rail	NR	NR
Demand Responsive	NR	NR
Commuter Rail	NR	NR
Ferry Boat	NR	NR
<b>ITS Standards Used Related to Transit Management</b>		
TCIP On Board Objects (TCIP-OB)	No	

Transit Management  
Agencies for Metropolitan Area: San Juan

	Puerto Rico Highway and Transportation Authority	
	1999	2005
TCIP Traffic Management Objects (TCIP-TM)	Yes	
TCIP Common Public Transportation Objects (TCIP-CPT)	No	
TCIP Passenger Information Objects (TCIP-PI)	No	
TCIP Incident Management Objects (TCIP-IM)	No	
TCIP Fare Collection Objects (TCIP-FC)	No	
TCIP Spatial Representation Objects (TCIP-SP)	No	
TCIP Control Center Objects (TCIP-CC)	No	
TCIP Scheduling/Runcutting Objects (TCIP-SCH)	No	
Send data communication between micro computer and heavy duty vehicle applications (SAE J1708)	No	
Would agency be willing to participate in testing of ITS Standards?	Yes	
Have agreements in place with other agencies to use similar hardware and software to aid maintenance and interoperability?	No	
<b>Electronic Fare Payment</b>		
<b>Have full operational Electronic Fare Payment System?</b>	Yes	
Methods of Fare Payment		
<i>Stored value card with fare deducted for each trip</i>		
Magnetic Stripe	Yes	
Smart Card	No	
Debit Card	Yes	
<i>Billed by the month for trips taken</i>		
Magnetic Stripe	No	
Smart Card	No	
Credit Card	Yes	
<i>Monthly Pass</i>		
Magnetic Stripe	Yes	
Smart Card	No	
Vehicles/Stations Equipped with Automated Payment Mechanism		
<i>Magnetic Stripe Readers</i>		
Fixed Route Bus Vehicles	0	30
Heavy or Rapid Rail Stations	0	16
Light Rail Stations	NR	NR
Demand Responsive Vehicles	NR	NR
Commuter Rail Stations	NR	NR
Ferry Boat Landings	NR	NR
<i>Smart Card Readers</i>		
Fixed Route Bus Vehicles	NR	NR
Heavy or Rapid Rail Stations	NR	NR
Light Rail Stations	NR	NR

Transit Management  
Agencies for Metropolitan Area: San Juan

	Puerto Rico Highway and Transportation Authority	
	<b>1999</b>	<b>2005</b>
Demand Responsive Vehicles	NR	NR
Commuter Rail Stations	NR	NR
Ferry Boat Landings	NR	NR
<u>Credit Card</u>		
Fixed Route Bus Vehicles	NR	NR
Heavy or Rapid Rail Stations	0	16
Light Rail Stations	NR	NR
Demand Responsive Vehicles	NR	NR
Commuter Rail Stations	NR	NR
Ferry Boat Landings	NR	NR
<u>Debit Card</u>		
Fixed Route Bus Vehicles	NR	NR
Heavy or Rapid Rail Stations	0	16
Light Rail Stations	NR	NR
Demand Responsive Vehicles	NR	NR
Commuter Rail Stations	NR	NR
Ferry Boat Landings	NR	NR
NR: No Response		

**Appendix J**  
**Transit Management Integration**

Transit Management Integration  
Agencies for Metropolitan Area: San Juan

Agency Name	Puerto Rico Highway and Transportation Authority	
	1999	2005
Agency Returned Survey?	Yes	
<b><u>Transit operators in the region that use the same electronic payment system</u></b>	Metropolitan Bus Authority	
<b><u>Toll operators from whom you accept electronic payment of transit fare through the use of ETC media</u></b>	None listed	
<b><u>Receiving real-time information via electronic means from others</u></b>		
<b><i>Freeway Management agencies from which your agency receives freeway travel times, speeds, and conditions</i></b>		
<i>Receive Information</i>	None listed	None listed
<i>Share Infrastructure</i>	None listed	None listed
<b><i>Arterial Management agencies from which your agency receives arterial travel times, speeds, and conditions</i></b>		
<i>Receive Information</i>	None listed	None listed
<i>Share Infrastructure</i>	None listed	None listed
<b><i>Incident Management agencies from which your agency receives incident severity, location, and type</i></b>		
<i>Receive Information</i>	None listed	None listed
<i>Share Infrastructure</i>	None listed	None listed

**Appendix K**  
**Transit Management Information Collection and Dissemination**

Data Collection and Dissemination: Transit Management  
Agencies for Metropolitan Area: San Juan

Agency Name	Puerto Rico Highway and Transportation Authority	
	1999	2005
Agency Returned Survey?	Yes	
<b>Methods used to disseminate transit information to the public</b>		
<b>Technologies your agency uses to disseminate:</b>		
Transit routes, schedules and fares	NR	Audible Enunciators, Monitors/VMS (not in vehicle), Kiosks, Internet Web Sites, Telephone System
Real-time transit schedule adherence or arrival and departure times	NR	NR
<b>Technologies employed by other organization receiving your data</b>		
Transit routes, schedules and fares	NR	NR
Real-time transit schedule adherence or arrival and departure times	NR	NR
Internet web site reporting transit routes, schedules and fare, etc.	No	
Telephone system for reporting transit information to the public	No	
<b>Organizations your agency sends information for dissemination to the public</b>	No	
<b>Data collected, archived, and/or transferred to another agency</b>		
Collected by your agency	Scheduled roadway work zones for transit, Current roadway work zones for transit, Incidents, Road conditions, Passenger count	NR
Archived by your agency	Scheduled roadway work zones for transit, Current roadway work zones for transit, Incidents, Road conditions, Passenger count	NR
Transferred to another agency by your agency	Incidents, Road conditions	NR
<b>Importance of making information available to the public</b>		
Ranked High	Scheduled roadway work zones for transit, Current roadway work zones for transit, Incidents, Road conditions	
Ranked Medium	Passenger count	
Ranked Low	NR	
<b>Groups that make requests for the data</b>	Consultants, MPOs, Media (I.e., TV stations, radio stations), Federal DOT personnel, State DOT personnel, Universities	
<b>What is the data used for?</b>	Research, Dissemination to the public, Roadway impact analysis, Planning, Construction impact determination, Traffic analysis	

**Appendix L**  
**Emergency Management**